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PROJECT MEMORANDUM

DATE:	May 1, 2013
FROM:	Claudia Zahorcak, PE – David Evans and Associates, Inc.
TO:	South Cooper Mountain Technical Advisory Committee
CC:	South Cooper Mountain Project Management Team
SUBJECT:	**Storm Water Existing Conditions**
PROJECT:	**South Cooper Mountain Concept and Community Plans**
	City of Beaverton #2752-13B
DEA PROJECT NO:	APGI0000-0002

Executive Summary

Information on the existing storm water system was gathered from the City of Beaverton and Clean Water Services. Their mapped files were used to establish an inventory of existing publicly owned storm water conveyance and treatment facilities and to identify potential connection points for service to the study area.

The Existing Streets and Natural Drainage map illustrates the streams and natural drainage boundaries within the study area. At the current time, there are no storm water conveyance and treatment facilities managed by either of these entities within the South Cooper Mountain study area. The only facilities are culverts and drainage ditches associated with roads and culverts conveying creeks under county roads. The Existing Storm Water Facilities map illustrates the existing closed conveyances that serve the areas north and east of the study area.

The City of Beaverton maintains open and closed conveyance facilities (i.e., ditches or creeks, and storm sewers, respectively) adjacent to the eastern and southeastern portions of the study area. The City owns and maintains the systems located within city limits, and will maintain new systems when constructed in the South Cooper Mountain Annexation Area.

Storm water from the northern half of the North Cooper Mountain area most likely currently drains north towards the CWS-managed systems connecting to Cross Creek, Butternut Creek, and Johnson Creek. The southern half drains toward the Urban Reserve Area and to the southwest.

While the majority of the Urban Reserve Area storm water currently drains to McKernon Creek through the southwest, the eastern portion drains to the east towards Summer Creek that flows through the City of Beaverton.

The majority of the South Cooper Mountain Annexation Area storm water flows south to an unnamed tributary to the Tualatin River. The eastern portion drains to the Summer Creek system that flows under SW Scholls Ferry Road and continues east.

Project Overview

The South Cooper Mountain Concept Plan will establish a vision that serves as a long-term guide for future growth and development of the South Cooper Mountain area. The Concept Planning process provides an opportunity to identify long term needs of the area and proactively address future challenges. This process will recognize the unique needs of the three distinct subareas (North Cooper Mountain, the Urban Reserve Area, and the South Cooper Mountain Annexation Area) while developing a holistic understanding of how the three areas could integrate and grow sustainably. The concept plan area totals 2,290 acres.

Community plans identifying appropriate comprehensive plan and zoning designations that implement the overall vision in the concept plan will be developed for the areas that are currently within the Urban Growth Boundary (UGB). The South Cooper Mountain Annexation Area Community Plan will designate specific areas for a range of housing types and densities, commercial and civic uses, and parks; preserve natural resources; provide for green infrastructure; and plan for new utilities, streets, trails and paths. The North Cooper Mountain Community Plan will reflect the needs of current residents in this already developed area, and result in an appropriate plan for the area's future. Planning for the Urban Reserve Area will guide how best to protect natural areas and Cooper Mountain Nature Park, where future urban development may occur, and where connecting streets, water lines, and other utilities should be located. A Finance Plan will identify realistic strategies for paying for infrastructure to serve the area.

Introduction

This memo provides a summary of existing storm water infrastructure within and adjacent to the South Cooper Mountain (SCM) study area, and of key physical features that will affect storm water planning as part of the planning activity. See the Existing Streets and Natural Drainage map for an illustration of the study area, streams and natural drainage boundaries, and existing streets within the area. There are three (3) sub-areas defined in this study. They are, as shown on the map, "North Cooper Mountain (NCM)," "Urban Reserve Area (URA)," and "South Cooper Mountain Annexation Area (SCMAA)." Noteworthy on the map is the delineation of natural drainage basins. Clean Water Services (CWS) has delineated basins within their service area. For this effort, David Evans and Associates, Inc. (DEA) delineated subbasins in the remaining area. The northern fringe of the NCM flows north, towards Cross Creek and Butternut Creek; the northeastern fringe of the NCM and URA flow towards Johnson Creek; and the eastern fringe portion of the URA and the SCMAA flow east towards Summer Creek. The bulk of the URA flows southwest to McKernon Creek. The bulk of the SCMAA flows south to an unnamed tributary of the Tualatin River.

The memo also reviews key physical features that will affect the study area's generation of stormwater and the range of potential methods for managing water quantity and quality. The selection of these methods is discussed further in the SCM Storm Water Future needs technical memorandum.

Existing Storm Water Conveyance and Treatment

Information on the existing storm water system was gathered from the City of Beaverton (City) and Clean Water Services (CWS). Their mapped files were used to establish an inventory of existing storm water infrastructure and to identify potential connection points for service to the study area.

At the current time, there are no storm water conveyance and treatment facilities managed by either of these entities within the SCM study area. The only facilities are culverts and drainage ditches associated with roads and culverts conveying creeks under county roads.

Washington County maintains county roads that run along the perimeter of the study area, such as SW Scholls Ferry Road, SW Tile Flat Road, SW Grabhorn Road, SW Kemmer Road and SW 175th Avenue. McKernon Creek and unnamed tributaries to the Tualatin River, Cross Creek, and Butternut Creek are crossed by these roads. The county would be responsible for maintaining any culverts to minimize upstream flooding.

The City maintains open and closed conveyance facilities (i.e., ditches or creeks, and storm sewers, respectively) adjacent to the eastern and southeastern portions of the study area. The City owns and maintains the systems located within city limits, and will maintain new systems when constructed in the SCMAA.

The Existing Storm Conveyance and Treatment map illustrates the existing closed conveyance facilities (gravity storm sewers) that serve the areas north and east of the study area.

North Cooper Mountain

A major drainage divides runs west to east through the middle of this area. SW Nancy Street, SW Miller Hill Road, SW Eagle Crest Terrace, SW Heightsview Court, and a portion of SW Heightsview Drive and SW 190th Avenue drains north towards SW Gassner Road and then north to subbasins that drain to Cross Creek and Butternut Creek. While it is possible that SW Gassner Road diverts portions of this flow differently, it can be assumed based on topography that storm water generated in the northern half of the NCM area is finding its way to ditches or to storm sewers included in the table below.

The developed area (SW Wolds Drive) west of SW Grabhorn road also is assumed to drain to a tributary of Cross Creek, based on topography; there are no storm water facilities to intercept this flow. The undeveloped area in the northeast section of NCM (east of SW 190th Avenue and north of SW Kemmer Road) drains to Johnson Creek South (Washington County); there are no existing storm water facilities to intercept this flow. The remainder of the NCM area drains south towards the URA area and eventually to McKernon Creek.

The following existing storm sewers would be likely connection points were the northern and eastern portions of the NCM area to be further developed and a storm water conveyance system installed.

The mapped information on existing ponds provided by CWS and the City shows numerous publicly owned storm ponds in the served areas north and northeast of the NCM area. These are likely small ponds serving a few properties and are not likely to be sufficiently sized to intercept or treat flows being contributed by the NCM areas flowing north or northeast.

UP-STREAM FACILITY ID	DOWN-STREAM FACILITY ID	LOCATION	MATERIAL	DIA-METER, inches	UPSTREAM ELEVATION	DOWN-STREAM ELEVATION	SLOPE	LENGTH, feet
107787	107786	SW 191st Avenue	CSP	12	663.18	617.52	0.1600	275
116802	116801	SW 191st Avenue	CSP	12	635.82	616.25	0.1012	191
116803	116802	SW Winslow Drive	CSP	12	642.45	635.62	0.0623	111
170410	170409	W of SW 195th Place	PVC	12	641.84	629.53	0.0985	125
277539	277538	SW Hayden Drive w of SW 187th Ave	PVC	12	656.07	649.95	0.0720	85
277562	277561	SW Hayden Drive e of SW 187th Ave	PVC	12	658.01	656.84	0.0079	148
283637	283634	SW Jeremy Street	PVC	12	731.22	731.05	0.0050	34
284789	284788	SW Valiant Drive	PVC	12	611.14	610.29	0.0090	94
284829	284824	SW 200th Terrace	DIP	12	613.20	611.35	0.0410	40

Urban Reserve Area

There are no inventoried public storm water facilities within the URA. The northern edge of the area, along SW Kemmer Road west of and up to its intersection with SW 175th Avenue, about 11 acres, could flow across SW Kemmer Road into existing facilities that eventually drain to Johnson Creek South (Washington County). Current actual drainage patterns have not been determined. This area is so small that the actual drainage pattern will likely be determined if or when the property is developed.

Flow from a 230-acre area along the eastern edge of the URA, extending south from SW Weir Road, would flow due east into a network of ditches and storm sewers that discharge into Summer Creek. No continuous sewer network exists that could channel this area's flow.

Flow from the 95-acre area north of Alford and east of SW 175th Avenue would drain south through the SCMAA towards SW Scholls Ferry Road and would eventually enter Summer Creek. The new storm water facilities for the SCMAA are east of 175th would need to account for this flow.

The mapped information on existing ponds provided by CWS and the City does not indicate the presence of publicly owned storm ponds in the served areas east of the URA area. If there are unmapped ponds, these are likely small ponds serving a few properties and are not likely to be sufficiently sized to intercept or treat flows being contributed by the URA area flowing east.

South Cooper Mountain Annexation Area

There are no existing storm water facilities in this area with the exception of road drainage and culverts carrying creek flow under SW Scholls Ferry and SW Tile Flat Roads. The western two-thirds of the SCMAA drain south to an unnamed tributary to the Tualatin River. Before entering the Tualatin River, this tributary joins with the unnamed creek draining the West Bull Mountain area (River Terrace) north of West Bull Mountain Road.

A very small portion of the eastern edge of the area, under 10 acres, might naturally drain east towards SW Loon Drive or SW Jaeger Terrace. The likely connection point to the existing City storm water facilities for this small area would be by connecting to a manhole (Junction 239527), the upstream end of a 10-inch storm sewer.

The eastern third of the SCMAA (east of SW 175th Avenue) drains to Summer Creek storm water facilities currently owned by the City of Beaverton. This system is a combination of short storm sewers connecting to the creek; currently the area north of SW Scholls Ferry drains to the creek which then flows under SW Scholls Ferry Road and continues flowing east through an open channel and a short length of 18-inch storm sewer.

UP-STREAM FACILITY ID	DOWN-STREAM FACILITY ID	LOCATION	MATERIAL	DIA-METER inches	LENGTH feet
SQ0810	SQ0809	SW Loon		10	105
SQ1506	SQ1505	SW Roshak at SW Barrows	CP-concrete	24	29

The City is in the final stages of documenting the Phase 1 - SW Scholls Ferry Road Sanitary Sewer Extension. Construction is anticipated to begin in April 2013. The extension consists of a new 21-inch-diameter sanitary sewer extending approximately 1,650 feet to the east from the intersection of SW 175th Avenue/SW Scholls Ferry Road to a manhole located approximately 90 feet south of SW Scholls Ferry Road. The future phase 2 extension will connect the 21-inch-diameter sewer to the existing system in SW Barrows Road. Existing storm sewers along the northern side of SW Scholls Ferry Road will remain in place, directing flow towards the open channel near Barrows Road.

The mapped information on existing ponds provided by CWS and the City does not indicate the presence of publicly owned storm ponds in the served areas south or east of the SCMAA area except along SW Barrows Road along Summer Creek. If there are unmapped ponds, these are likely small ponds serving a few properties and are not likely to be sufficiently sized to intercept or treat flows being contributed but the SCMAA area flowing east.

Basin Characterization

Storm water runoff generated by a land area is largely determined by the percentage of area in impervious cover. Both the total volume and the peak flow rate resulting from storms of a typical return frequency (e.g., 1-year, 2-year, 10-year) will increase as an area shifts from forested, to pasture (grass), to developed areas (buildings, paved surfaces). The ability of unpaved (e.g., pervious) areas to absorb rainfall and not create runoff, is related to land cover, soil type, slope, and the depth to groundwater.

Much of the NCM area has already been developed in 1-acre lots. This corresponds to roughly 15 percent impervious area, assuming roof and driveway runoff flow to a storm drainage system (from Table 2.3 in the Western Washington Storm Water Manual) and remaining grass is in good condition.

CWS recommends the use of the Low Impact Development Approach (LIDA) wherever possible, primarily to assist with managing storm water quality, with an associated benefit for managing quantity as well. LIDA employs infiltration wherever possible, and detention through dry ponds, vegetated swales, ecoroofs, and roof and street planters to capture flow from small areas prior to its release into conveyance systems or natural channels. The applicability of the infiltration method of LIDA is reduced in certain soil types, steep areas, and areas with high groundwater.

The National Resources Conservation Service (NRCS), part of the U.S. Department of Agriculture, publishes soil information for Washington County, Oregon, including classification into hydrologic soil groups (HSG). The soils in the area are predominantly hydrologic soil Group C (90.8 percent); 6.1 percent is HSG D and 3.1 percent is HSG C/D. These soils are moderately conducive to infiltration.

SOIL GROUP	PERCENT	AREA acres	DRAINAGE POTENTIAL	SLOPE RANGES percent
C	90.8	2075	Well drained Moderately well drained Somewhat poorly drained	0 to 60
D	6.1	139	Poorly drained	3 to 12
C/D	3.1	72	Poorly drained Somewhat poorly drained	Not defined

Description — Hydrologic Soil Group

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Source: http://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx

About 50 percent of the area is Cornelius and Kinton silt loams, HSG C with water table 27 to 37 inches below grade (36 percent under 12 percent slope, 11 percent 12 to 20 percent slope, and 3 percent greater than 20 percent slope). Cascade silt loam represents 24 percent of the area (18 percent under 12 percent slope, 8 percent greater than 12 percent slope).

For about 90 percent of the soils, the water table is less than 3 feet from the surface or the slope exceeds 20 percent, which make them generally impracticable for infiltration. Site-specific evaluation should be made before assuming a site is suitable for infiltration.

About 10 percent of the basin may be suitable for infiltration; however, site specific analysis is still required. These would generally be in Saum soils, HSG C, depth to water table 80+ inches, most less than 20 percent slope.

The map entitled South Cooper Mountain Hydrologic Soil Groups illustrates the distribution of these three types of soils in the study area.

The NRCS data also included depth to groundwater and slopes. For about 90 percent of the soil types, the water table is less than 3 feet from the surface or the slopes exceed 20 percent, both of which make them generally impracticable for infiltration. Site-specific evaluation should be made.

About 10 percent of the basin may be suitable for infiltration; however, site specific analysis is still required. We selected mapped soil units which were HSG C with slopes up to 20 percent and depth to groundwater greater than three feet. These include only four mapped units: Helvetia silt loam (7 to 12 percent slopes) and Saum silt loam (three units ranging from 2 to 20 percent slope). Areas with these soils are shown on the map South Cooper Mountain Soils Potentially Suitable for infiltration. The total acreage in these four units is 307 acres, or 13 percent of the study area. They are located in the southern half of the NCM (drains to McKernon Creek); the eastern portion of the URA (drains to Summer Creek); the western portion of the URA along SW Grabhorn Road; and two small areas of the SCMAA (drain to unnamed tributary of the Tualatin River).

Specific areas that are also not suitable for infiltration as a means for storm water management from adjacent areas include wetlands and the riparian areas adjacent stream channels in the study area. These locations will be dictated by the Natural Resources analysis being prepared as part of the SCM study and will be factored into the analysis after that work has been reviewed and approved.

Based on this analysis of soils, slope, and depth to groundwater, our conclusion is that infiltration will be only marginally useful as a technique for managing stormwater in the SCM area, as shown in the map entitled Soils Potentially Suitable for Infiltration. Managing impervious area and detention of stormwater will be the primary means for controls for planning purposes. However, land use and site layout techniques can be used during planning, regardless of the site soil conditions. As development occurs, LIDA techniques should be evaluated on a site basis.

Attachments:

South Cooper Mountain Existing Streets and Natural Drainage Map
South Cooper Mountain Existing Storm Conveyance and Treatment Map
South Cooper Mountain Hydrologic Soil Groups Map
South Cooper Mountain Soils Potentially Suitable for Infiltration Map

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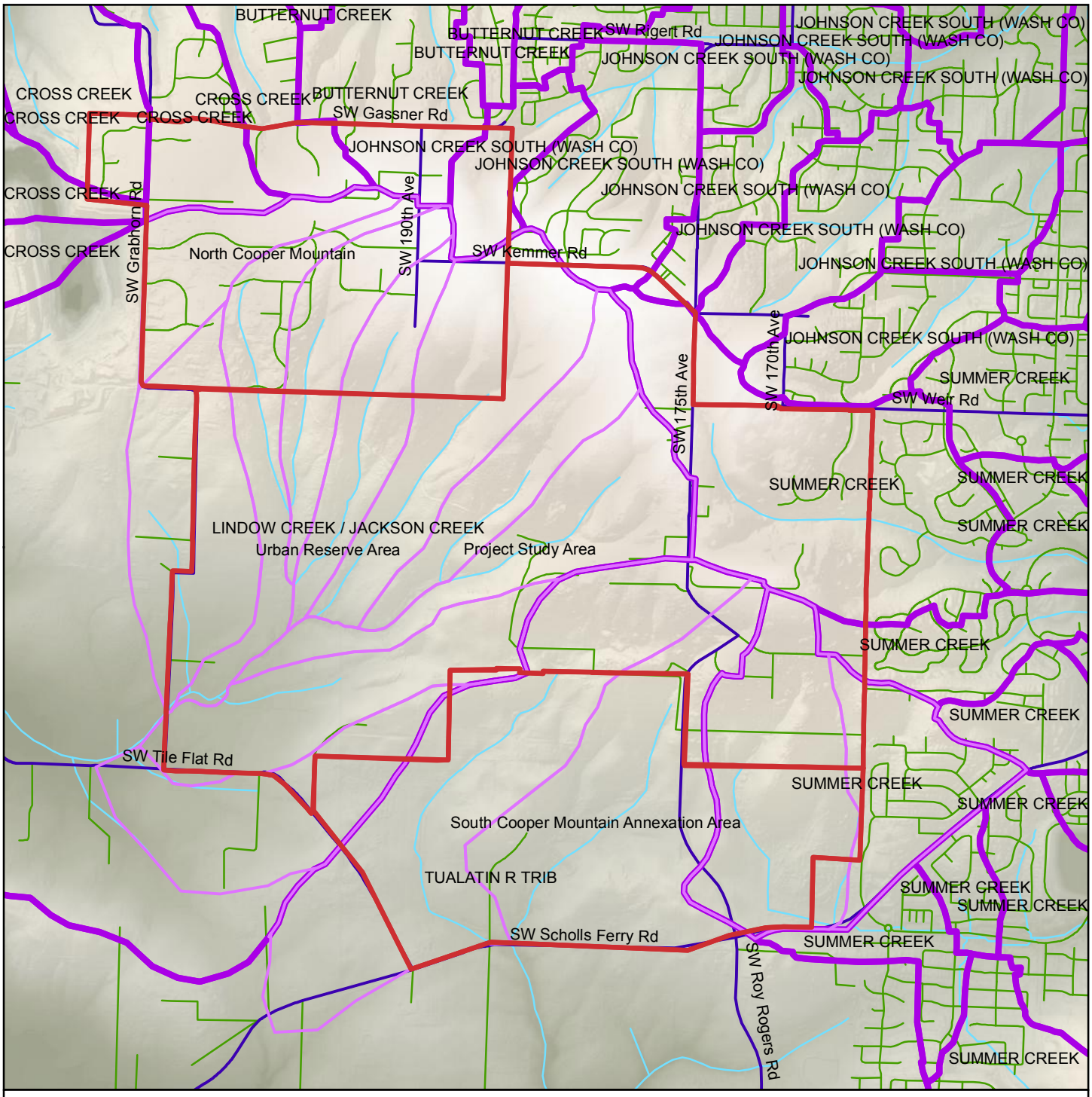

South Cooper Mountain Existing Streets and Natural Drainage

Legend

- SCM Subbasins
- Streams
- CWS Subbasins
- South Cooper Mountain Study Area
- SCM Arterials
- Streets

Prepared By: David Evans and Associates

Date: 5/1/2013

Coordinate System: NAD 1983 HARN StatePlane Oregon North FIPS 3601 Feet Intl

DISCLAIMER

This map is intended for informational purposes only. It is not intended for legal, engineering, or surveying purposes. While this map represents the best data available at the time of publication, the City of Beaverton makes no claims, representations, or warranties as to its accuracy or completeness. Metadata available upon request.

NORTH

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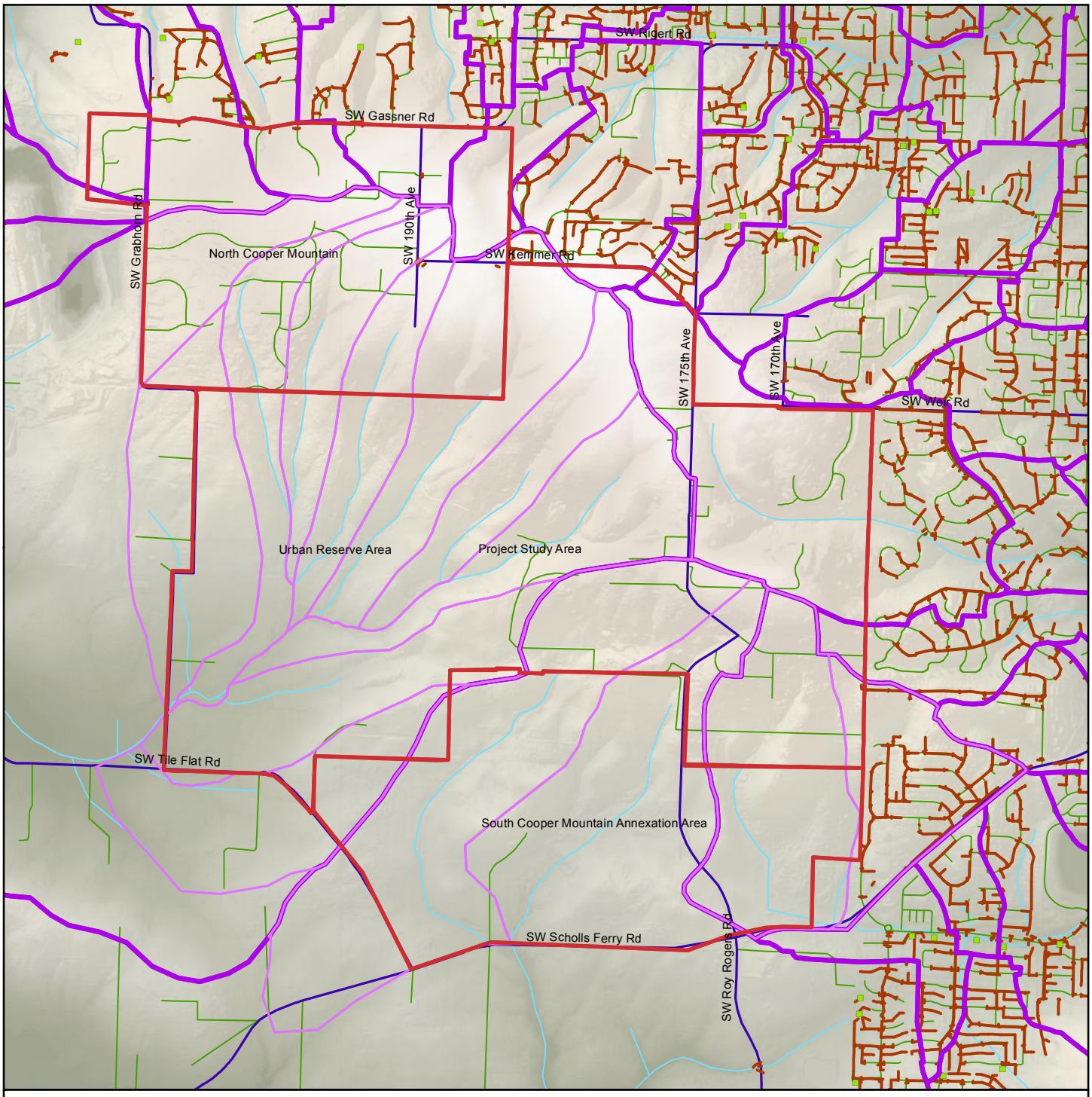

South Cooper Mountain Existing Storm Conveyance and Treatment

Legend

- Gravity Storm Sewers
- Storm Ponds
- SCM Arterials
- streets
- Streams
- SCM Subbasins
- CWS Subbasins
- South Cooper Mountain Study Area

Prepared By: David Evans and Associates

Date: 4/16/2013

Coordinate System: NAD 1983 HARN StatePlane Oregon North FIPS 3601 Feet Intl

NORTH

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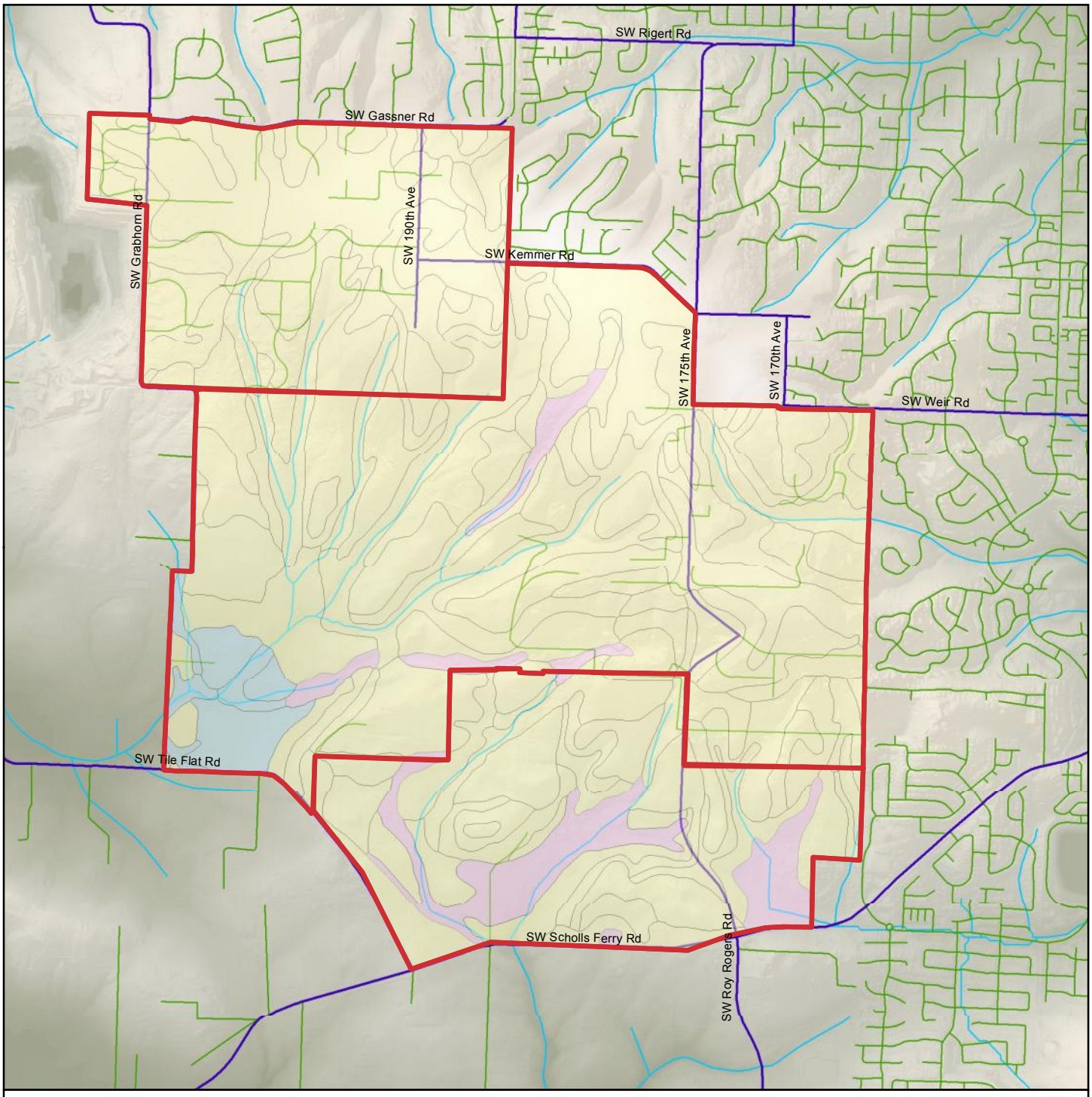

South Cooper Mountain Hydrologic Soil Groups

Legend

Hydrologic Soil Group

- C
- C/D
- D

- SCM Arterials
- Streets
- Streams
- South Cooper Mountain Study Area

Prepared By: David Evans and Associates

Date: 4/16/2013

Coordinate System: NAD 1983 HARN StatePlane Oregon North FIPS 3601 Feet Intl

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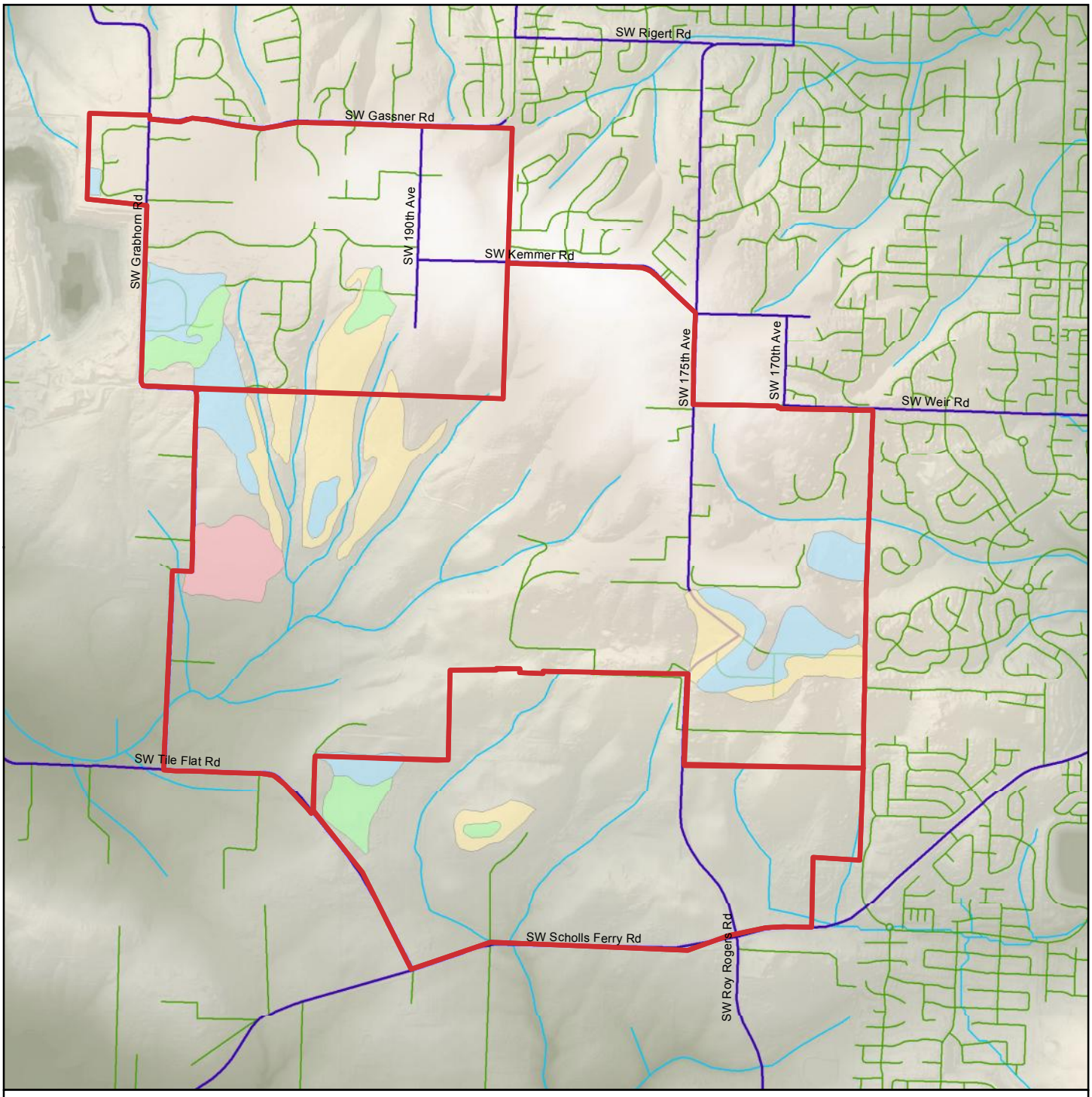

South Cooper Mountain Soils Potentially Suitable for Infiltration

Legend

Soil Map Unit

- 19C (Helvetia silt loam 7 to 12 percent slopes)
- 38B (Saum silt loam, 2 to 7 percent slopes)
- 38C (Saum silt loam, 7 to 12 percent slopes)
- 38D (Saum silt loam, 12 to 20 percent slopes)
- Streams
- SCM Arterials
- Streets
- South Cooper Mountain Study Area

Prepared By: David Evans and Associates

Date: 5/1/2013

Coordinate System: NAD 1983 HARN StatePlane Oregon North FIPS 3601 Feet Intl

NORTH

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